# STANDING STOCKS OF FISHES IN SECTIONS OF JULIE CREEK, PLUMAS COUNTY, 1992

## INTRODUCTION

We caught brown trout (Salmo trutta) in Julie Creek (Figure 1) in August and September, 1992. Julie Creek was sampled as part of a continuing program sponsored by the Department of Water Resources (DWR) which was designed to investigate the status of trout populations in tributaries in the Indian Creek watershed. Other tributaries sampled as part of this program include Red Clover Creek (Brown 1976, Brown 1990, Brown 1991), Hungry Creek (Brown 1992a), Little Grizzly Creek (Brown 1992b), Ward Creek (Keeney and Brown 1992) and Crystal Creek (Brown 1992c). These creeks were sampled to provide information on trout life history and growth that will allow Indian Creek to be managed in a manner that will provide the best habitat for trout reproduction and survival. This is the first time Julie Creek has been sampled as part of the Indian Creek studies.

## METHODS

Standing stocks of fishes were estimated at three stations in Julie Creek (Figure 1), Plumas County, in August, 1992. Stations varied in length from 38 to 59 m (Appendix 1). The length, average width, and average depth of each station was measured. Fish were captured with a battery-powered backpack electroshocker in stream sections blocked by

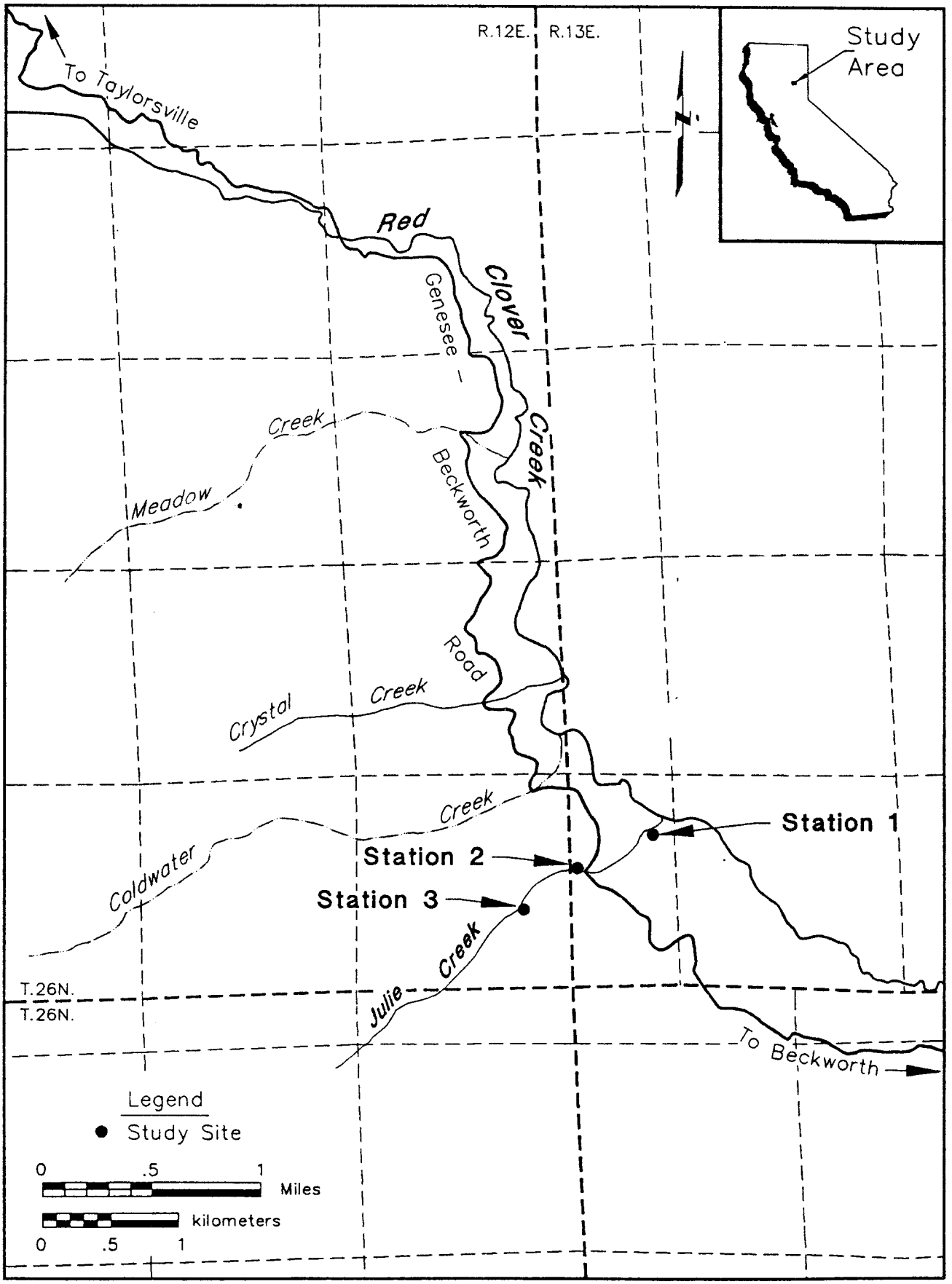


**Figure 1. Station sampled to estimate biomass of trout in Julie Creek, Plumas County, 1992.**

seines. Captured fish were removed from the net-enclosed section on each pass. Standing stock estimates were developed using the two-count method of Seber and LeCren (1967) or the multiple-pass method of Leslie and Davis (1939) with limits of confidence computed using a formula proposed by DeLury (1951).

Trout were also sampled in September, 1992, to gather additional information on growth.

The weights of brown trout (Salmo trutta) were determined by displacement. Weights were measured for all trout caught. Fork length was measured to the nearest millimeter for each trout.

Scale samples were taken only from brown trout over 100 mm in length. Scales were mounted dry between microscope slides, and their images were projected on a NCR microfiche reader at a magnification of 42x. Scale measurements for the calculation of growth were recorded to the nearest millimeter along the anterior radius of the anterior-posterior axis of the scale.

Geometric mean functional regressions were used to describe the body-scale and length-weight relationships (Ricker 1975). Estimation of true mean growth rate was calculated using methods of Ricker (op. cit.).

The distribution of brown trout caught is listed according to location. Standing crops of brown trout were calculated for individual stations where they were caught. Age and growth were calculated for the population. Mean individual growth was calculated for brown trout. Length-weight relationships, coefficient of condition, and 95 percent confidence intervals were also calculated for brown trout.

## RESULTS

### Distribution

Brown trout were caught at stations 1 through 3. No other species of fish was caught (Table 1).

TABLE 1. Distribution of Fishes in Sections of Julie Creek, Plumas County, 1992.

| | Station Number | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Distance above creek mouth (km) | 0.2 | 0.8 | 1.6 |
| Brown Trout | X | X | X |

## Standing Crop

Brown trout were the only fish caught in Julie Creek. Biomass averaged 20.4 g/m$^2$ at three stations. Biomass for brown trout large enough for fishermen to catch and keep (127 mm FL and larger) averaged 11.3 g/m$^2$ (Table 2).

TABLE 2. Estimate of Brown Trout Standing Crop in Julie Creek, Plumas County, 1992.

| Distance Below Frenchman Dam (km) | Population Estimate | 95% Confidence Interval | Estimate of Biomass (g/m$^2$) | Catchable Trout (≥ 127 mm FL) | Biomass of Catchable Trout (g/m$^2$) |
|---|---|---|---|---|---|
| 0.2 | 124 | 94-161 | 18.7 | 12 | 11.4 |
| 0.8 | 137 | 110-167 | 18.2 | 30 | 13.0 |
| 1.6 | 223 | 201-246 | 24.4 | 29 | 9.6 |

## Age and Growth

The formula $L = 6.5 + 0.2\ S$ describes the relationship between the fork length (L) and enlarged scale radius (S) of 97 brown trout caught in Julie Creek. The coefficient of correlation ($r^2$) is 0.79.

The population instantaneous growth rate was faster in age 1+ brown trout than in age 2+ trout. Mean individual instantaneous growth was faster in age 2+ trout (Table 3).

TABLE 3. Growth Rates for Brown Trout Caught in Julie Creek, Plumas County, 1992.

| | Population Growth | | | Mean Individual Growth | | |
|---|---|---|---|---|---|---|
| Age | Length Interval (mm) | Difference of Natural Logarithms | Instantaneous Growth Rate Gx | Length Interval (mm) | Difference of Natural Logarithms | Instantaneous Growth Rate Gx |
| 1-2 | 86-115 | 0.589 | 1.767 | 96-155 | 0.479 | 1.437 |
| 2-3 | 155-242 | 0.446 | 1.338 | 142-242 | 0.533 | 1.599 |

Age 1+ brown trout averaged 129 mm in fork length; 2+ fish averaged 185 mm and 3+ trout averaged 269 mm (Table 4).

TABLE 4. Calculated Fork Length of Brown Trout from Julie Creek, Plumas County, 1992.

| | | | Calculated Lengths at Successive Annuli | | |
|---|---|---|---|---|---|
| Age | # of Fish | Capture Length (mm) | 1 | 2 | 3 |
| 1 | 62 | 129 | 86 | - | - |
| 2 | 22 | 185 | 96 | 155 | - |
| 3 | 2 | 269 | 105 | 142 | 242 |
| Number of back-calculations | | | 86 | 24 | 2 |
| Weighted means (mm) | | | 89 | 154 | 242 |
| Increments (mm) | | | 89 | 65 | 88 |

## Length and Weight

Age group 0+ brown trout represented 67 percent of the catch. Ages 1+ and 2+ fish represented 24 percent and 8 percent, respectively, while 3+ fish made up 1 percent (Figure 2 and Appendix 2).

The relationship between length (L) and weight (W) of brown trout is:

$$\text{Log}_{10} W = -4.9 + 3.0 \text{ Log}_{10} L$$

$$r^2 = 0.99$$

N = 409 (Figure 3 and Appendix 3)

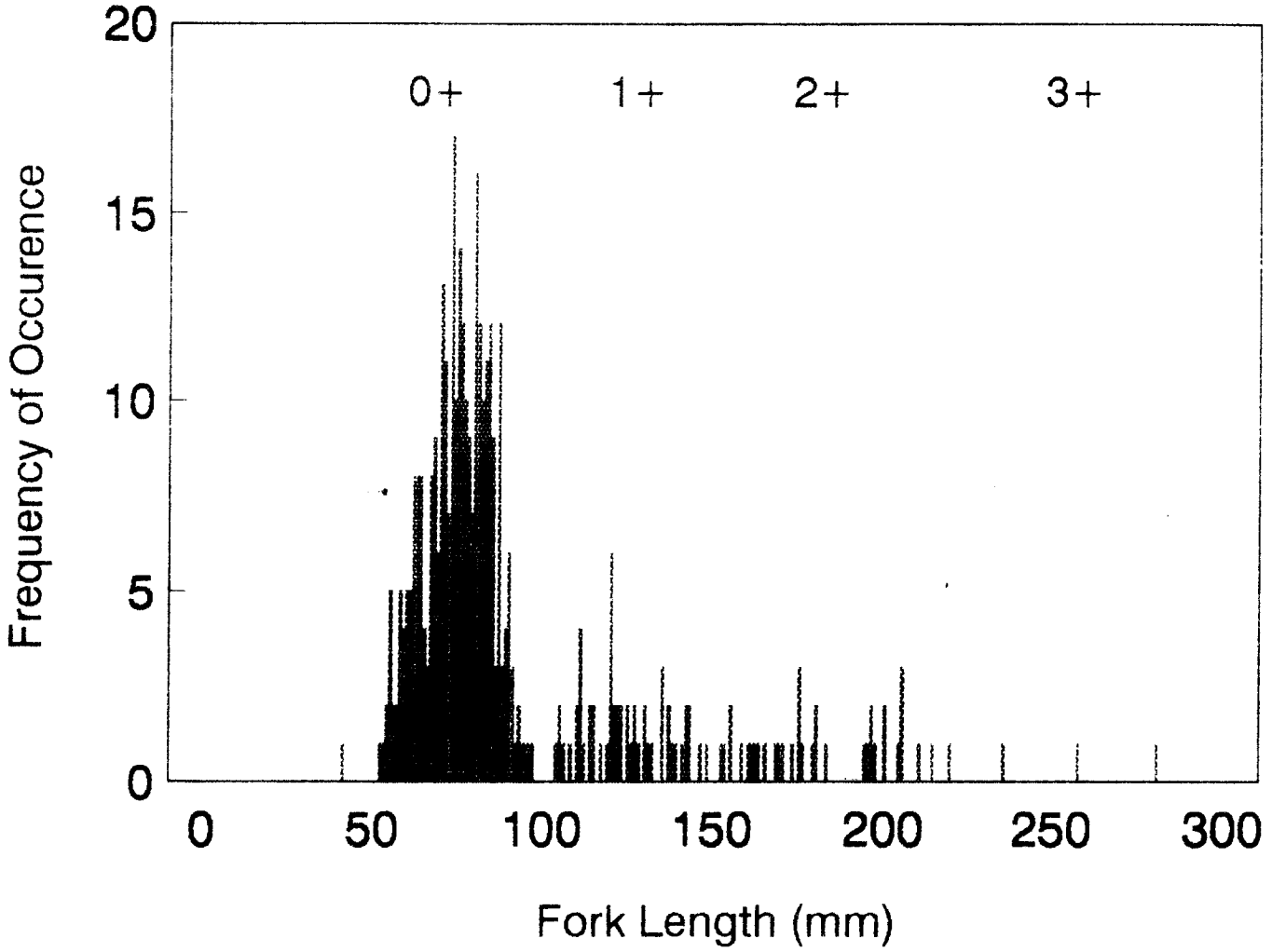


FIGURE 2. Length, observed frequency, and age of brown trout caught in Julie Creek, Plumas County, 1992.

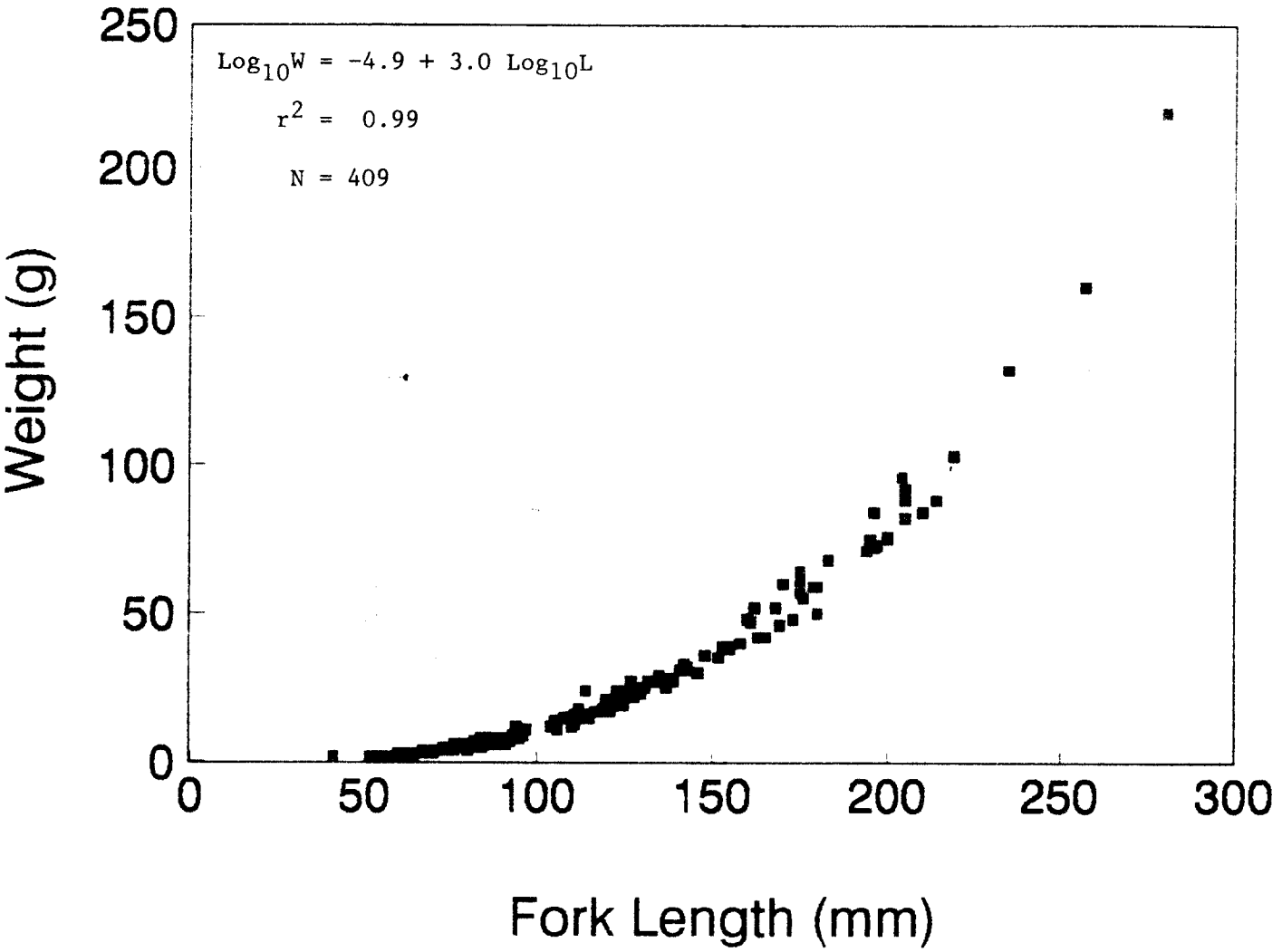


FIGURE 3. The relationship between length and weight of brown trout caught in sections of Julie Creek, Plumas County, 1992.

## Coefficient of Condition

We calculated the coefficient of condition and 95 percent confidence limits for a total of 409 brown trout (Table 5). There is no significant difference between the coefficient of condition for any age group of brown trout.

TABLE 5. Condition of Brown Trout in Julie Creek, Plumas County, 1992.

| Age Group | Number of Fish | Coefficient of Condition | 95% Confidence Interval |
|---|---|---|---|
| Brown Trout | | | |
| 0+ | 280 | 1.0815 | 0.7512-1.4098 |
| 1+ | 92 | 1.0669 | 0.8332-1.3005 |
| 2+ | 34 | 1.0286 | 0.8432-1.2140 |
| 3+ | 3 | 0.9873 | 0.9242-1.0505 |
| Combined | 409 | 1.0722 | 0.7725-1.3719 |

We have sampled 12 stations in five streams that held brown trout since 1976. Population estimates averaged 14 trout per station. Biomass averaged 1.9 g/m$^2$ (Table 6). Julie Creek supports more brown trout than any other tributary to Indian Creek we have sampled.

TABLE 6. Estimates of Brown Trout Standing Crop and Biomass in Five Tributaries to Indian

| Stream | Number of Stations | Average Number of Trout | Average Biomass ($g/m^2$) |
|---|---|---|---|
| Red Clover Creek | 2 | 2 | 0.1 |
| Squaw Queen Creek | 1 | 1 | 0.1 |
| Last Chance Creek | 5 | 2 | 0.2 |
| Hungry Creek | 1 | 4 | 2.4 |
| Julie Creek | 3 | 161 | 20.4 |
| Average | | 14 | 1.9 |

## LITERATURE CITED


Brown, C.J. 1976. Standing stocks of fishes in sections of Red Clover, Little Last Chance, Big Grizzly, Last Chance, and Squaw Queen creeks, Plumas County, 1976. California Department of Fish and Game.

_____. 1990. Results of sampling fish in sections of Red Clover Creek, Plumas County, 1988. California Department of Fish and Game.

_____. 1991. Standing stocks of fishes in sections of Red Clover Creek, Plumas County, 1990. California Department of Fish and Game.

_____. 1992a. Standing stocks of fishes in sections of Hungry Creek, Plumas County, 1990. California Department of Fish and Game.

_____. 1992b. Standing stocks of fishes in sections of Little Grizzly Creek, Plumas County, 1990. California Department of Fish and Game.

_____. 1992c. Standing stock of trout in a section of Crystal Creek, Plumas County, 1992. California Department of Fish and Game.

DeLury, D.B. 1951. On the planning of experiments for the estimate of fish populations. J. Fish Res. Bd. Canada. 8:281-307.

Keeney, S. and C.J. Brown. 1992. Standing stock of trout in a section of Ward Creek, Plumas County, 1990. California Department of Fish and Game.

Leslie, P.H., and D.H.S. Davis. 1939. An attempt to determine the absolute number of rats in a given area. J. Animal Ecology. 8:94 - 113.

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Fish. Res. Bd. Canada. Bull. 191, 382 p.

## APPENDIX 1

## FISH POPULATION STATIONS ON JULIE CREEK, PLUMAS COUNTY, AUGUST, 1992

Station 1 - Located about 0.2 km upstream from the juncture of Julie Creek and Red Clover Creek (UTM 071 279). Water flows quickly through a relatively steep section of creek at this station. The creek flows through a narrow channel. Pools make up about 25% of the surface area and riffles make up 75%. Unlike the other stations, this station is lightly shaded (5%) by alders. Substrate is gravel and volcanic bedrock with few cobbles. The station is 59 m long and has a surface area of 135.7 $m^2$ and a volume of 19.7 $m^3$ at 0.08 cms.

Station 2 - Located about 0.8 km upstream from the juncture of Julie Creek and Red Clover Creek and 18.5 m upstream of the Genesee-Beckworth road bridge (UTM 075 282). Pools make up about 35% of the surface area and riffles make up 65%. Like station 1, this station is heavily shaded (95%) by alders. Substrate is sand, gravel, and cobbles. The station is 49.5 m long and has a surface area of 138.6 $m^2$ and a volume of 18.2 $m^3$ at 0.08 cms.

Station 3 - Located about 1.6 km upstream from the juncture of Julie Creek and Red Clover Creek.(UTM 080 284). This station is composed of a series of riffles that drop into short pools. Pools represent 20% of the surface area while riffles make up the remaining 80%. Station 1 is heavily shaded (95%) by alders. Substrate is cobbles and gravel. The station is 38 m long and has a surface area of 79.8 $m^2$ and a volume of 10.4 $m^3$ at 0.08 cms.

## APPENDIX 2

## LENGTH AND NUMBER OF BROWN TROUT CAUGHT IN JULIE CREEK, PLUMAS COUNTY, 1992

| | |
|---|---|
| 41 | 1 |
| 52 | 1 |
| 53 | 1 |
| 54 | 2 |
| 55 | 5 |
| 56 | 2 |
| 57 | 2 |
| 58 | 5 |
| 59 | 4 |
| 60 | 5 |
| 61 | 5 |
| 62 | 8 |
| 63 | 8 |
| 64 | 8 |
| 65 | 4 |
| 66 | 3 |
| 67 | 8 |
| 68 | 9 |
| 69 | 6 |
| 70 | 13 |
| 71 | 11 |
| 72 | 7 |
| 73 | 17 |
| 74 | 10 |
| 75 | 14 |
| 76 | 12 |
| 77 | 10 |
| 78 | 9 |
| 79 | 7 |
| 80 | 16 |
| 81 | 12 |
| 82 | 10 |
| 83 | 11 |
| 84 | 12 |
| 85 | 9 |
| 86 | 3 |
| 87 | 12 |
| 88 | 3 |
| 89 | 4 |
| 90 | 6 |
| 91 | 3 |
| 92 | 1 |
| 93 | 2 |
| 94 | 1 |
| 95 | 1 |
| 96 | 1 |
| 97 | 1 |
| 104 | 1 |
| 105 | 2 |
| 106 | 1 |
| 108 | 1 |
| 110 | 2 |
| 111 | 4 |
| 112 | 1 |
| 114 | 2 |
| 115 | 2 |
| 117 | 1 |
| 119 | 1 |
| 120 | 6 |
| 121 | 2 |
| 122 | 2 |
| 123 | 2 |
| 125 | 2 |
| 126 | 1 |
| 127 | 2 |
| 128 | 1 |
| 130 | 2 |
| 131 | 1 |
| 132 | 1 |
| 135 | 3 |
| 137 | 2 |
| 138 | 1 |
| 139 | 1 |
| 141 | 1 |
| 142 | 2 |
| 143 | 2 |
| 146 | 1 |
| 148 | 1 |
| 152 | 1 |
| 153 | 1 |
| 155 | 2 |
| 158 | 1 |
| 160 | 2 |
| 161 | 1 |
| 162 | 2 |
| 163 | 1 |
| 165 | 1 |
| 168 | 1 |
| 169 | 1 |
| 170 | 1 |
| 173 | 1 |
| 175 | 3 |
| 176 | 2 |
| 179 | 1 |
| 180 | 2 |
| 183 | 1 |
| 191 | 1 |
| 194 | 1 |
| 195 | 2 |
| 196 | 2 |
| 197 | 1 |
| 199 | 1 |
| 200 | 3 |
| 202 | 1 |
| 204 | 1 |
| 205 | 3 |
| 210 | 1 |
| 214 | 1 |
| 217 | 1 |
| 219 | 1 |
| 227 | 1 |
| 235 | 1 |
| 257 | 1 |
| 280 | 1 |

LENGTH AND WEIGHT OF BROWN TROUT CAUGHT IN JULIE CREEK, PLUMAS COUNTY, 1992

| Fork Length (mm) | Weight (gm) | Fork Length (mm) | Weight (gm) |
|---|---|---|---|
| 41 | 2 | 91 | 6,7,8 |
| 52 | 2 | 92 | 7 |
| 53 | 2 | 93 | 8,9 |
| 54 | 2,2 | 94 | 12 |
| 55 | 2,2,2,2,2 | 95 | 8 |
| 56 | 2,2 | 96 | 9 |
| 57 | 2,2 | 97 | 11 |
| 58 | 2,2,2,2,2 | 104 | 12 |
| 59 | 2,2,2,2 | 105 | 13,14 |
| 60 | 2,2,2,2,3 | 106 | 11 |
| 61 | 2,2,3,3,3 | 108 | 15 |
| 62 | 2,2,2,2,3,3,3,3 | 110 | 12,15 |
| 63 | 2,3,3,3,3,3,3,3 | 111 | 13,15,15,16 |
| 64 | 2,2,3,3,3,3,3,3 | 112 | 18 |
| 65 | 3,3,3,3 | 114 | 15,24 |
| 66 | 3,3,3 | 115 | 15,16 |
| 67 | 3,3,3,3,3,3,4,4 | 117 | 17 |
| 68 | 3,3,3,3,3,3,4,4,4 | 119 | 18 |
| 69 | 3,3,3,3,4,4 | 120 | 17,17,17,18,19,21 |
| 70 | 3,3,3,3,4,4,4,4,4,4,4,4,4 | 121 | 17,20 |
| 71 | 4,4,4,4,4,4,4,4,4,4,4 | 122 | 19,19 |
| 72 | 4,4,4,4,4,4,4 | 123 | 21,24 |
| 73 | 4,4,4,4,4,4,4,4,4,4,4,4,4,5,5,5,5 | 125 | 19,22 |
| 74 | 4,4,4,4,4,4,5,5,5,5 | 126 | 23 |
| 75 | 4,4,4,4,4,4,4,4,4,5,5,5,5,5 | 127 | 23,27 |
| 76 | 4,4,4,4,4,4,4,4,5,5,5,5,6 | 128 | 22 |
| 77 | 5,5,5,5,5,5,5,5,5,5,6 | 130 | 23,25 |
| 78 | 5,5,5,5,5,5,5,5,5 | 131 | 25 |
| 79 | 5,5,5,5,5,5,6 | 132 | 27 |
| 80 | 4,5,5,5,5,5,5,5,5,5,6,6,6,6,6,6 | 135 | 27,27,29 |
| 81 | 5,5,5,5,6,6,6,6,6,6,6,6 | 137 | 25,25 |
| 82 | 5,5,6,6,6,6,6,6,6,6,7 | 138 | 28 |
| 83 | 5,6,6,6,6,6,6,6,7,7,7,7 | 139 | 27 |
| 84 | 5,6,6,6,6,6,6,7,7,7,7,7,8 | 141 | 31 |
| 85 | 6,6,6,6,6,6,6,7,7,7 | 142 | 32,33 |
| 86 | 6,7,7 | 143 | 31,32 |
| 87 | 6,6,6,6,7,7,7,7,7,7,7,8 | 146 | 30 |
| 88 | 6,7,8 | 148 | 36 |
| 89 | 8,8,8,8 | | |
| 90 | 7,7,7,7,7,8 | | |

| Fork Length (mm) | Weight (gm) | Fork Length (mm) | Weight (gm) |
|---|---|---|---|
| 152 | 35 | 200 | 75,76,97 |
| 153 | 39 | 202 | 96 |
| 155 | 38,39 | 204 | 96 |
| 158 | 40 | 205 | 82,88,92 |
| 160 | 43,48 | 210 | 84 |
| 161 | 47 | 214 | 88 |
| 162 | 52,55 | 217 | 115 |
| 163 | 42 | 219 | 103 |
| 165 | 42 | 227 | 142 |
| 168 | 52 | 235 | 132 |
| 169 | 46 | 257 | 160 |
| 170 | 60 | 280 | 220 |
| 173 | 48 | | |
| 175 | 57,61,64 | | |
| 176 | 55,69 | | |
| 179 | 59 | | |
| 180 | 50,59 | | |
| 183 | 68 | | |
| 190 | 76 | | |
| 191 | 82 | | |
| 194 | 71 | | |
| 195 | 75,90 | | |
| 196 | 72,84 | | |
| 197 | 73 | | |
| 199 | 77 | | |